

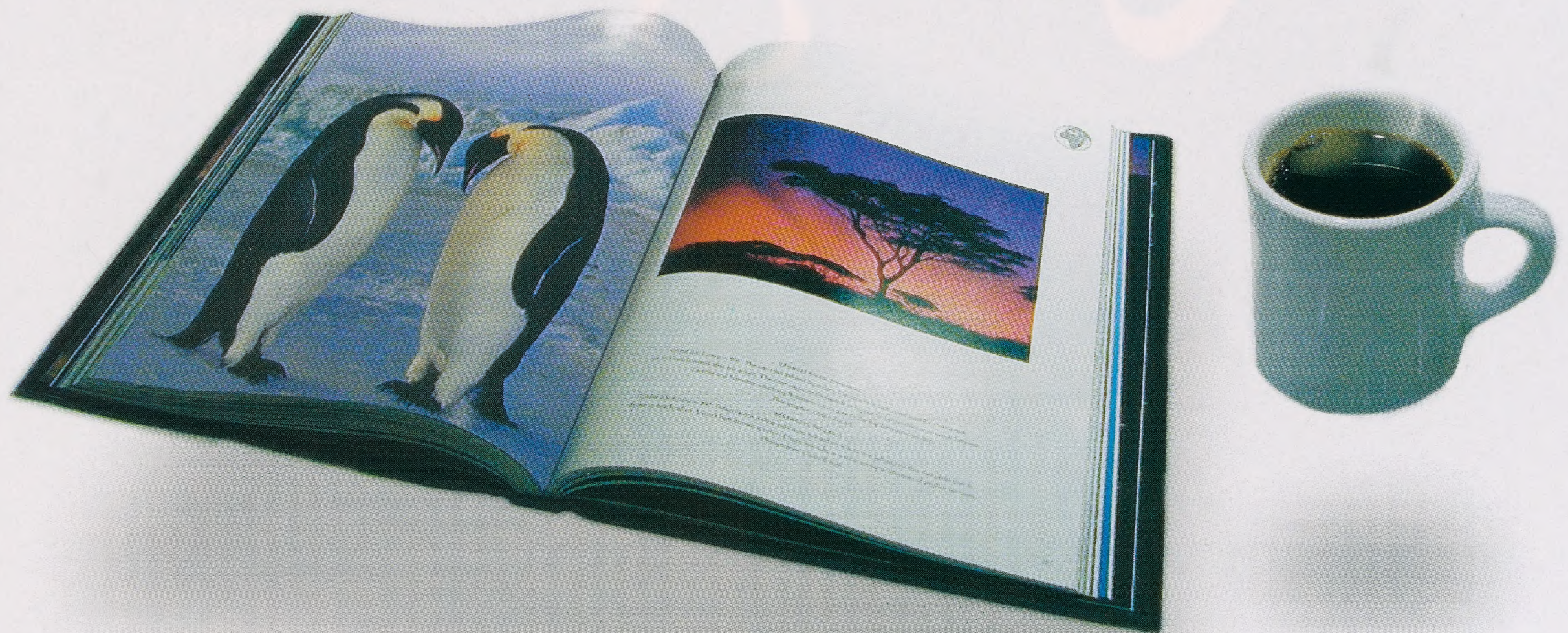
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Zoogoer

VOLUME 28 / NUMBER 6



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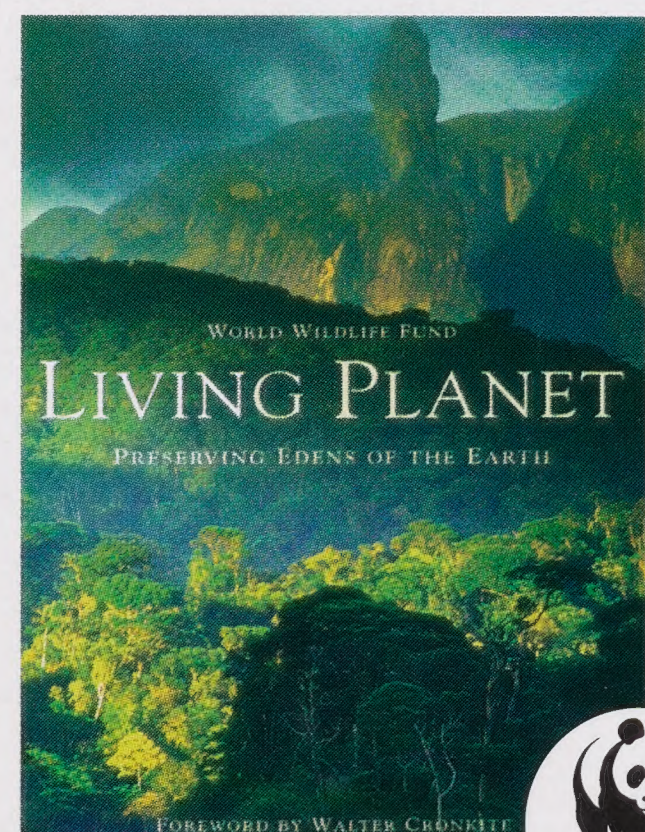
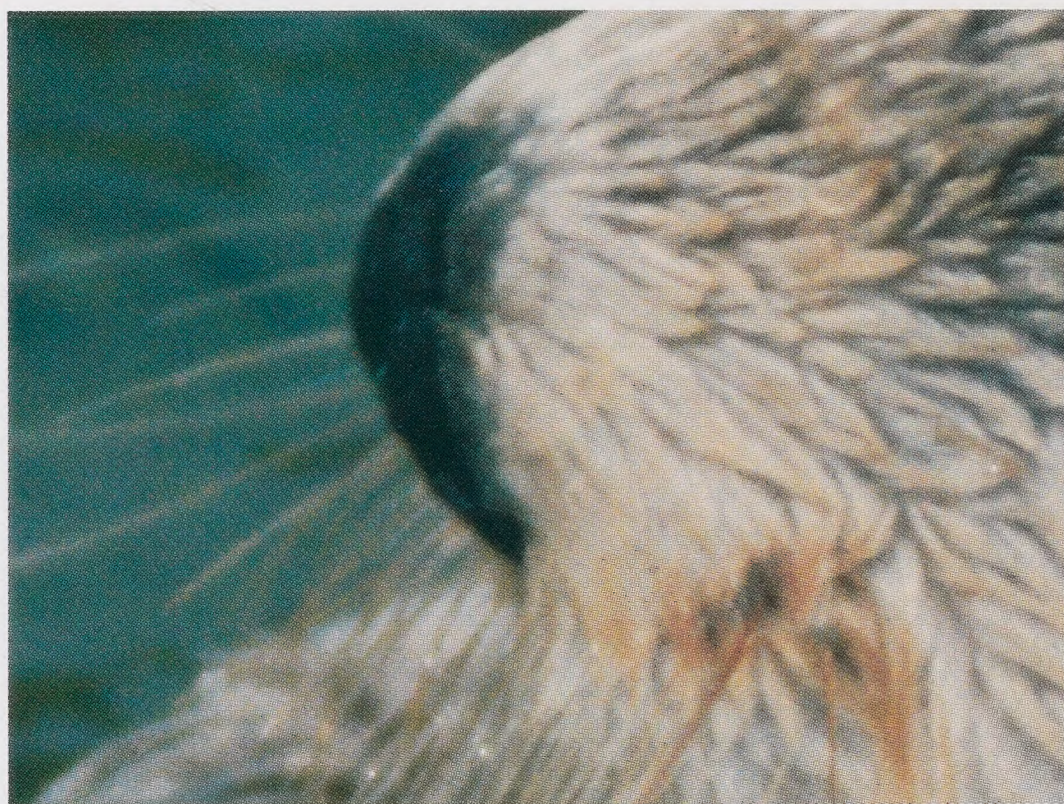
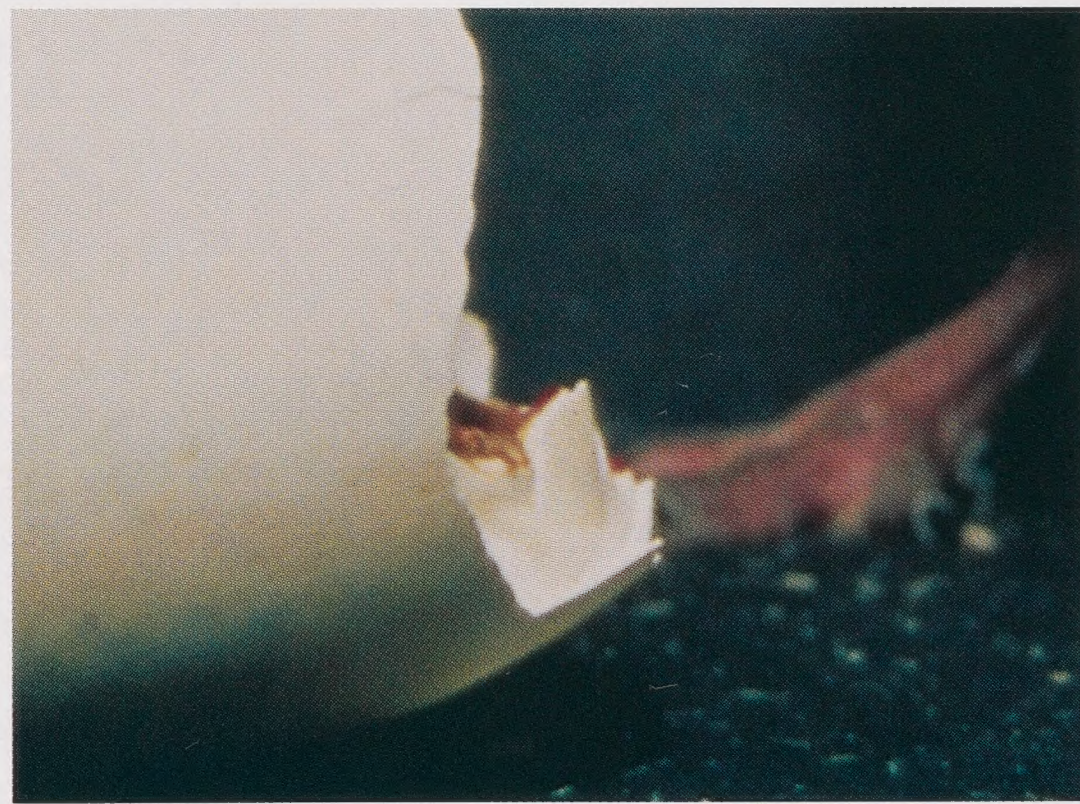


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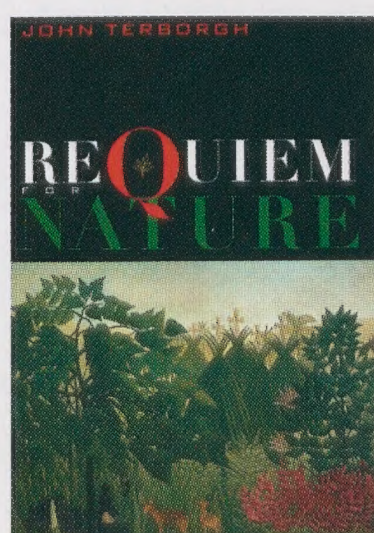
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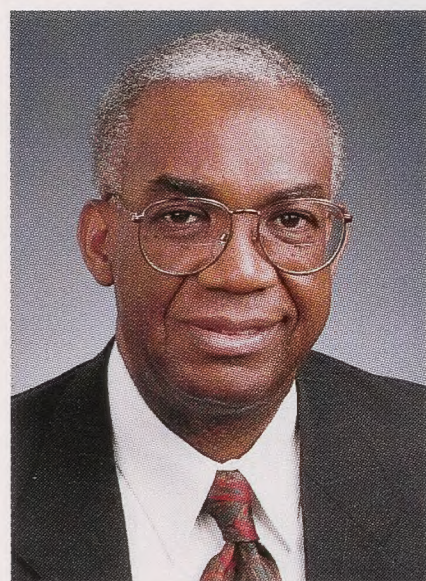


To look backward for a while is to refresh the eye, to restore it,
and to render it more fit for its prime function of looking forward.
—Margaret Fairless Barber

TALK OF THE MILLENNIUM

However much one might like to, it's impossible to escape talk of the millennium. So I'm going to join right in and add my two bits to the already over-full pot. Here at FONZ we struggled to come up with a way to celebrate the arrival of the year 2000—to find some relevant animal angle. We struggled in vain. A millennium, the passage of 1,000 years, is just not a biological phenomenon. It is like the passage of a week or an hour, arbitrary times we invented to regulate our lives without reference to natural rhythms like days and years.

Still, we can use the pause for thought inspired by the millennium to reflect on the state of the natural world. Historian David Fromkin, in his remarkable 200-page history, *The Way of the World: From the Dawn of Civilizations to the Eve of the Twentieth Century*, provides perspective on how we got where we are today.



According to Fromkin, the last 1,000 years of scientific and technological advances “transformed human life and prospects more profoundly than had any achievement since apes engendered humans, and humans invented agriculture and civilization.” The natural world and our relationship to it have also been profoundly transformed. Most of these advances increased our ability to conquer and tame nature, a process that was set in motion when our ape-like ancestors first used a tool. They have also had huge and negative im-

pacts on the environment, particularly since the industrial revolution. Surprisingly, Fromkin points out, it took until about 100 years ago, when the modern conservation movement emerged, for people to begin to recognize the impacts.

The National Zoo's founding in 1889, at the dawn of the conservation movement, was inspired, in part, by a growing awareness of our impacts on wildlife. At that time, the numbers of bison, beavers, sea otters, and more had been reduced to nearly nothing, while passenger pigeons, Carolina parakeets, and great auks were already extinct. This was also the period in which the first national parks were created to preserve some of the wilderness then remaining.

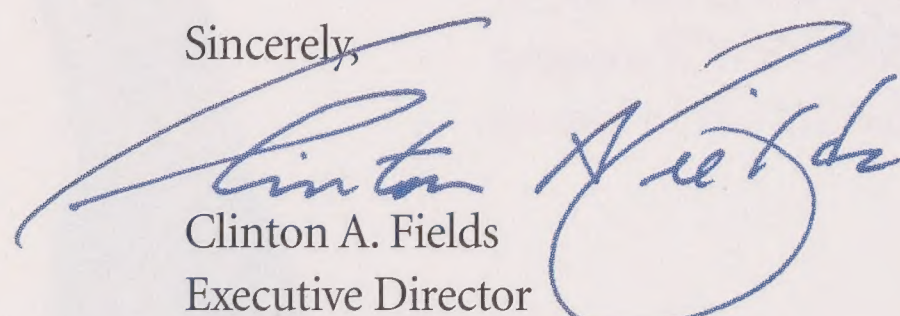
Fromkin believes the next most important milestone in environmentalism was the publication of Rachel Carson's *Silent Spring* in 1962. This, Fromkin writes, “marked an ideological transformation; what had been the conservation movement now was inspired with something broader than a simple desire to keep the wilderness wild. It went on to embrace the cause of the global environment.”

There are still those who think that environmentalism, and especially wildlife conservation, is a luxury, or irrelevant. But this is becoming a minority position and, while we decry the slow pace of environmental recovery, set against the span of all human history or even just the last millennium, the speed with which protecting our environment is becoming a mainstream concern is astonishing. This, and the extent of the problem, makes Fromkin think we are poised for a transformation in which society assumes responsibility “for the planet in its entirety.”

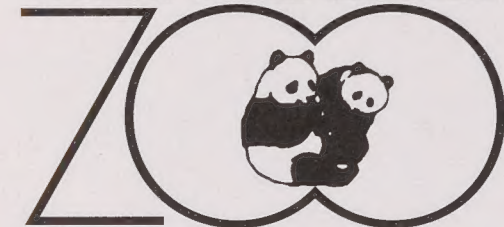
How well we carry out that responsibility, and how soon we begin, will determine what our world looks like in another millennium.

Rachel Carson said, “The human race is challenged more than ever before to demonstrate our mastery, not over nature but of ourselves.” I hope our descendants, just 30 or 40 generations away, look back and judge that we met that challenge and left them a world worth living in. That is why I believe so strongly in our conservation education mission at FONZ and the Zoo. As FONZ members, you are already knowledgeable and concerned about the state and fate of the Earth. But to hasten the social transformation that Fromkin predicts is near, more people, especially children, must get the message now. There is no time to lose.

Sincerely,


Clinton A. Fields
Executive Director

Friends of the National



is a nonprofit organization of individuals, families, and organizations who are interested in helping to maintain the status of the Smithsonian National Zoological Park as one of the world's great zoos, to

foster its use for education, research, and recreation, to increase and improve its facilities and collections, and to advance the welfare of its animals.

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The Smithsonian National Zoological Park is located at 3001 Connecticut Ave., N.W., Washington, DC 20008-2537. Weather permitting, the Zoo is open every day except December 25. Hours: From May 1 to September 15, grounds are open from 6 a.m. to 8 p.m.; buildings, 10 a.m. to 6 p.m. From September 16 to April 30, grounds are open from 6 a.m. to 6 p.m.; buildings, 10 a.m. to 4:30 p.m. **Director:** Michael H. Robinson.

Membership in FONZ offers many benefits: publications, discounts on shopping, programs, and events, free parking, and invitations to special programs and activities to make zoogoing more enjoyable and educational. To join, write FONZ Membership, National Zoological Park, Washington, DC 20008, or call 202.673.4961.

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Cover: California sea otter (*Enhydra lutris*) feasts on a crab
Photo by Jeff Foott Productions.

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REFRESH
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SENSES.



NOTES NEWS

ANIMAL NEWS

The Sumatran tiger cub triplets, Chrissie, Eric, and Mike, can now be seen outside at the Great Cats exhibit. Born to mom Kerinci on June 24, the cubs first pawed their way onto the terraced grass habitat on September 22, under the close watch of animal keepers. The cubs returned outdoors with their mother on Saturday, September 25, to the coos of onlookers.

What's the reason, you may ask, for the cubs' less-than-exotic names? "Mike" pays tribute to the Smithsonian National Zoo's director, Michael Robinson, and to the departing Secretary of the Smithsonian, Michael Heyman. Eric and Chrissie are the names of two children who won the National Geographic *World Magazine*/Save the Tiger Fund Kids Speak Out for Conservation Poster Contest. Some examples of this wonderful art can be found at the Great Cats exhibit.

Zoo staff plan to let the triplets play out in the grass with their mother at 11 a.m. each day, usually



for two hours or so. However, keepers let Kerinci decide when to bring her cubs inside. Come early, and often: The cubs, like kids, will grow up faster than you think.

Also joining the Zoo's community of mega-mammals is Willie, a 16-year-old male spectacled bear, newly arrived from the Memphis Zoo. Willie seemed to ignore his original name, Wesley—but who's to argue with a 250-pound bear? He now lives alongside the Zoo's two other spectacled bears, Roger and Bandit (a female). Spectacled bears are endangered in their native habitat in South America. The Zoo staff hope that Willie and Bandit will eventually breed and have offspring.

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See ad on the next page for details.

THE ZOO'S A STAGE...

Two theater troops are delivering festive frivolity to FONZ members during the holiday season. Blue Sky Puppet Theatre, which has delighted kids for over two decades, will perform "Rufus the Red Nose Raindog" on Saturday, December 11, at 1:30 p.m. and 3:00 p.m. The Battersby Duo, a renowned musical comedy team, will continue the family fun on Sunday, December 12, at 1:30 p.m. and 3:00 p.m.

In the spirit of the season, FONZ sponsors these free programs in the hopes of contributing to the less fortunate children in our community. We ask that each person attending the show, adult or child, bring a wrapped gift to donate. Gifts should be marked with the approximate age and sex of the child for whom the gift is appropriate. Performances will be held in the Zoo's Visitor Center Auditorium. The shows are very popular, and space is limited, so please call 202.673.4962 to reserve seats.

FONZ BOARD ELECTIONS

FONZ announced the results of its Board of Directors election at the 1999 Annual Meeting on October 15. Three new directors joined the Board: Jane W. Gaston, Richard C. Hotvedt, and Jeffrey Lande. Returning for a third term is Patricia A. Bradley. The new officers are Carole A. Valentine, President; David Perry, First Vice-President; Alberta Allen "Missy" Kelly, Second Vice-President; Mark Handwerger, Treasurer; and Michelle V. Hagans, Secretary.

M. Lee Sutherland, former

President of Friends of the National Zoo, is retiring from the Board after nine years of service, and has been appointed to the Board's Advisory Committee, where he joins another former Board Member, Terry Peel, who is also newly appointed. Anna B. Martin, Executive Director of the Office of the Under Secretary, will replace Ross B. Simons as the Smithsonian representative to the FONZ Board. Gloria Kreisman was appointed to fill the unexpired term of Robert J. Smith, who resigned from the Board.



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“HOW DO YOU ZOO?”

Imaginations will run wilder than lions when the FONZ “How Do You Zoo?” exhibit (formerly ZooLab) opens to the public this winter. Following a complete renovation and expansion, the new exhibit will be an educational play area geared toward elementary school groups and children ages five to ten.

“How Do You Zoo?” replicates elements of a zoo in miniature. Visitors will find reconstructions of an animal exhibit area, an animal keeper office, a commissary, and a veterinary hospital, with equipment modeled on what the Zoo really uses. Children will be encouraged to role-play, choosing between jobs as an animal keeper, an

animal nutritionist, and a veterinarian. While activating their imaginations, “How Do You Zoo?” will teach kids what running a zoo and caring for animals is really like.

Workshops to train teachers interested in bringing school groups to “How Do You Zoo?” will be held on two Saturdays, January 22 and February 5, from 9 to 11 a.m. and from 1 to 3 p.m. each day. The \$10 workshop fee includes an exhibit resource guide and the two-hour orientation. Please visit the online “Teacher’s ToolBox” at www.fonz.org/education/htz_toc.htm for a description of the exhibit program and for reservation forms.

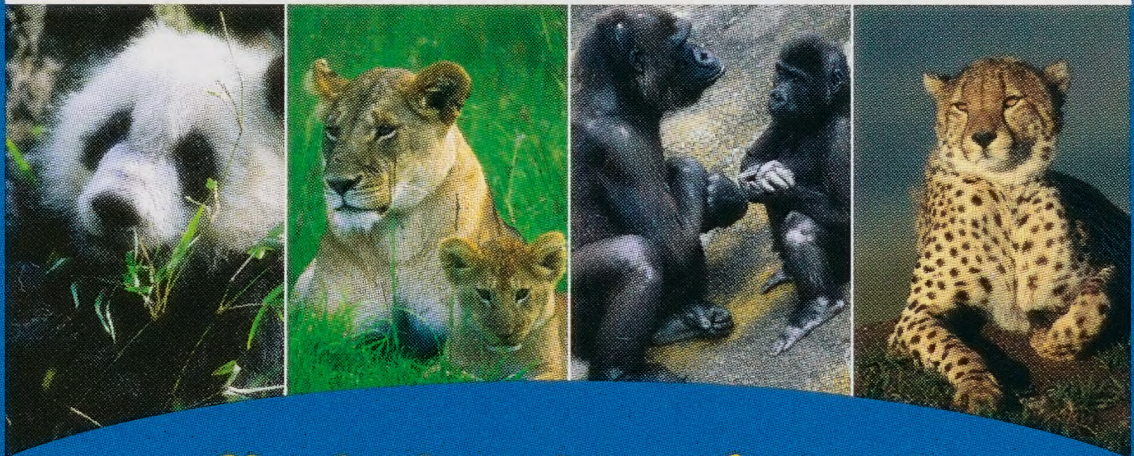
WILD HOLIDAY SHOPPING

If you still prefer shopping the old-fashioned way—in person—you will find exotic gift ideas at FONZ’s National Zoo Stores at Union Station and Fair Oaks, as well as at the Zoo itself. FONZ has also opened a store at the Springfield Mall for the duration of the holiday season. The store will remain open until December 26.

Mall madness erupts at “Zoostravaganza” on Saturday, November 13, when Fair Oaks Shopping Center is transformed into a wild kingdom of life-sized, life-like animals. This special day will include children’s activities, a silent auction, and an evening visit from a certain jolly, white-bearded gentleman with a twinkle in his eye. Proceeds will benefit the FONZ’s Giant Panda Conservation Fund.

So come get a jump on the holiday shopping with your 20 percent FONZ member discount—and keep an eye out for reindeer.
—Alex Hawes

Do your holiday shopping online and help save...Us!



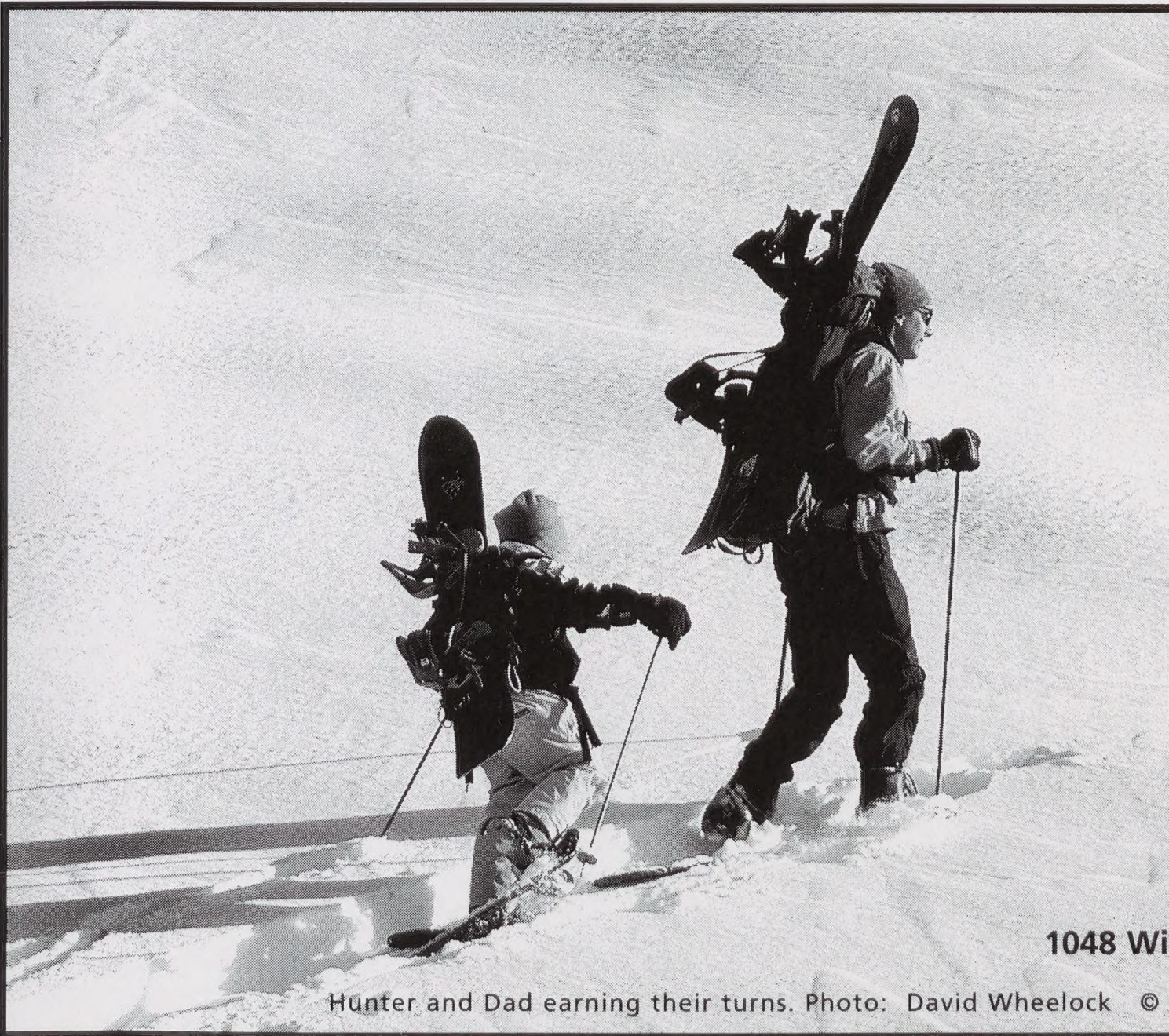
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Hunter and Dad earning their turns. Photo: David Wheelock © Patagonia, Inc. 1999 800.336.9090 • www.patagonia.com



BY ROBIN MEADOWS

When it comes to protecting sea otters off the central coast of California, the U.S. Fish & Wildlife Service is damned if it does and damned if it doesn't. By federal law, sea otters must be kept out of most of the state's southern coastal waters. But doing so may imperil this threatened species, which, after years of increase, is now declining for unknown reasons.

The Californ

BETWEEN A

SEA OTTERS AND FISHERMEN ARE
COMPETING FOR SHELLFISH ALONG
THE CALIFORNIA COAST.

A close-up photograph of a California Sea Otter floating on its back in the water. The otter's head is in the upper right, with its eyes and black nose visible. It is holding a piece of red sea urchin in its mouth. The water is dark blue and rippled. The otter's fur is wet and matted.

California Sea Otter:

ROCK AND A HARD PLACE

Sea otters (*Enhydra lutris*) once ranged all along the Pacific Rim from northern Japan to Baja California, Mexico. Hunted for their luxuriant fur, the otters plunged from as many as 300,000 individuals before intensive harvesting began in the mid-1700s to only 1,000 to 2,000 in 13 small populations by about 1900. When they were finally protected under the 1911 International Fur Seal Treaty, sea otters were thought to be extinct in California.

Then in 1914, 32 sea otters were discovered along the state's central coast near Big Sur. The California sea otter population has since grown, albeit slowly, to about 2,000 and its range has inched toward the southern coast's shellfish-rich waters.

Therein lies the heart of problem: Sea otters and the shellfish industry are both after the same prey—and the otters are not subject to industry regulations.

Because sea otters lack the blubber that helps other marine mammals keep warm in the cold ocean water, they have to eat a lot. A single adult male, which weighs about 65 pounds, can go through 20 pounds of abalone, sea urchins, and other shellfish in just one day. Sea otters are such efficient predators that once they move into an area, they can strip it bare of large, accessible shellfish. "The before and after is really a shock," says sea urchin harvester Bruce Steele. "It's hard to comprehend how they can take so much so fast."

Biologists reply that southern California's shellfish levels are artificially high. They argue that the only reason these coastal waters are so shellfish-rich is that the otters were wiped out there decades ago. Now that the otters are returning, the shellfish populations are merely dropping back to their historical levels.

The conflict between California's sea otters and shellfishermen last came to a head during the early 1980s. At that time, the biggest threat to the otters was oil spills. The U.S. Fish & Wildlife

Service (USFWS) decided to minimize that threat by establishing new colonies in the sea otter's historic range. Biologists thought the best bet for a new colony was San Nicolas Island, which lies 60 miles off Los Angeles. But shellfishermen went ballistic at the thought of reintroducing the sea otter into what they saw as their prime fishing grounds.

To appease the shellfish industry, in 1986 the USFWS agreed to set up a "no-otter zone" along the south coast of the state in exchange for establishing a colony at San Nicolas Island. At the time, the compromise seemed like a win-win plan: The shellfishermen's livelihood was guaranteed and the otters gained a hedge against being wiped out in the event of a huge oil spill.

But trouble began right away. Although the waters off San Nicolas Island support plenty of shellfish and seem like a perfect place for sea otters, to the bewilderment of biologists the re-introduction of sea otters to San Nicolas has been a complete flop. Between 1987 and 1991, about 140 otters were moved from the main central coast population to the island and at least 50 pups have been born there. But even so, the number of sea otters living at the island has

never been higher than 20 since the initial relocation. "It's a huge mystery," says Ventura-based USFWS biologist Steve Alcorn. "For whatever reason, it just hasn't worked."

Five years into the effort to establish a new sea otter colony at San Nicolas Island, biologists learned that there was a second big problem with the plan. Even if the new colony was a complete success, it still wouldn't be enough to protect the species from catastrophic oil spills. The 1992 Exxon Valdez spill killed thousands of Alaskan sea otters—more than the total California population—and spread more than 400 miles in a month. An oil spill this size could reach the otter populations both along the central coast and at San Nicolas Island.

Furthermore, the USFWS plan to maintain a no-otter zone is easier to do on paper than in real life. Finding and capturing sea otters in the open ocean is extremely time-consuming and expensive. Efforts to remove ten otters reported in the no-otter zone included four week-long boat trips—and even then only two of the otters were caught. Maintaining the no-otter zone in 1992 cost nearly \$10,000 per otter captured.

In light of all these problems, last year the Sea Otter Recovery Team, a ten-person advisory panel, recommended ditching the plan to establish new colonies, which would also mean ditching the no-otter zone. Instead, the team recommended allowing the main population to expand naturally along the southern coast.



THE BIG SUR SHORELINE, WHERE CALIFORNIA SEA OTTERS WERE REDISCOVERED EARLIER THIS CENTURY.





SEA OTTERS SOCIALIZE AMID THE KELP BEDS OF CALIFORNIA'S CENTRAL COAST.

To the consternation of the shellfish industry, that's just what is happening now. The main population has been expanding steadily along the coast and, as of January 1999, about 150 otters have moved south into the former no-otter zone.

The shellfish industry is accusing the USFWS of breaking its promise to protect their livelihood by maintaining the no-otter zone. The Santa Barbara-based California Seafood Council warns that reneging on this deal will further erode trust in government, and some fear that this could sour efforts to reintroduce predators elsewhere. For instance, USFWS's otter flip-flop could strengthen ranchers' opposition to reintroducing gray wolves to the Yellowstone area.

But USFWS biologists say they have no choice. For one thing, moving otters out of the zone probably wouldn't do any good. Biologists now know that moving sea otters is usually a waste of time. "They have strong homing instincts and can navigate accurately back to their capture

location over hundreds of miles," says Sea Otter Recovery Team member Katherine Ralls, a National Zoo research zoologist. "We shouldn't move them because many of them will just come back."

More important, moving sea otters from the no-otter zone could harm the species' chances of survival. After a decade of steady growth, the California sea otter has declined for four years in

Maintaining the no-otter zone in 1992 cost nearly \$10,000 per otter captured.

a row. The spring count has dropped 12 percent, from nearly 2,400 in 1995 to fewer than 2,100 in 1999. Biologists fear that maintaining the no-otter zone would jeopardize the species further. Capturing and relocating otters is so hard on them that about five percent die, and the population simply can't afford any more losses, says Alcorn.

The USFWS's foremost concern is figuring out why the California sea otter population is declining. In theory, reasons could include fewer

pup births, more otters dying of disease, and more otters drowning in fishing gear. Biologists have ruled out the first two possibilities because otter rates of reproduction and deaths due to disease have long been constant.

Although there is no solid link, the California sea otter's recent decline does correlate, however, with an increase in fisheries along the central coast. Based on preliminary data, the National

Marine Fisheries Service estimates that fishery-related sea otter losses have increased from very few in 1995 to almost 50 in 1998. "Losses of this

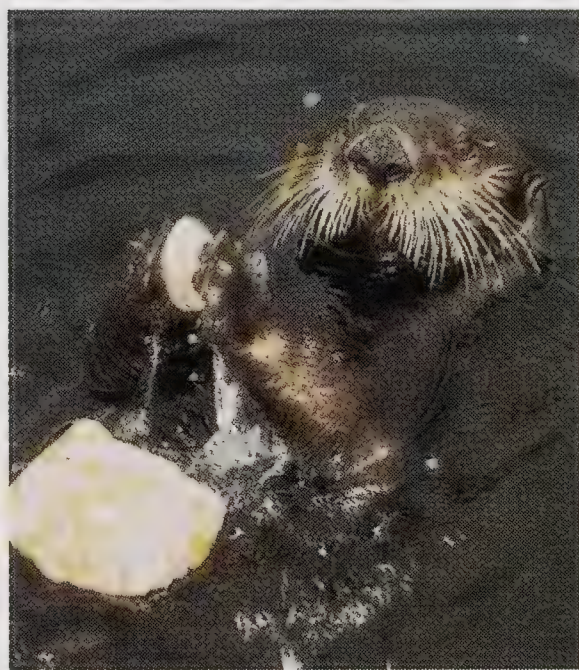
magnitude would significantly impact sea otter population trends," write Jim Estes and Brian Hatfield of the Biological Resources Division of the U.S. Geological Survey in "Population Status of the California Sea Otter," a 1998 report prepared for the USFWS. They caution that more research is needed to determine whether the increase in fisheries really is harming the sea otters.

While disease is not a factor in the recent decline, it could be detrimental to the California sea otters' long-term prospects. Analysis of otter

OTTER WORLD

OTTERS, LIKE WEASELS, SKUNKS, AND badgers, are members of the mustelid family. They range in size from one and a half feet to six and a half feet in length. The various otter species also differ in their social structures. Some, such as the sea otter, live almost entirely solitary lives, while others, such as the giant otter of the Amazon (*Pteronura brasiliensis*), live in family groups. All otters exist on diets of various aquatic delicacies, such as crabs, octopi, fish, mollusks, bivalves, urchins, and snails.

The 13 different species of otter are found in the freshwater streams, rivers, lakes, and coastal areas of five continents. (There are no otters in Antarctica or Australia.) More than half of these species are considered threatened or vulnerable by the IUCN/World Conservation Union. Otters generally sit at the top of their food chains, but as cubs they can fall victim to jaguars, wolverines, killer whales, and other predators.



JEFF FOOT PRODUCTIONS

However, the main threats to the survival of most otter species are disease and a host of man-made troubles: the fur trade, poaching, pollution, pesticides, road mortality, dams, habitat destruction, and fishing nets. As a result, in spite of being protected in most countries, the populations of many of the world's otter species are in decline. While the North American river otter (*Lutra canadensis*) is believed to be the most numerous of the otters, its cousin, the elusive Congo clawless otter (*Aonyx congica*), is so rare that it may in fact be extinct already.

The National Zoo exhibits two species of otters: the North American river otter and the Asian small-clawed otter (*Aonyx cinerea*). Check out www.otternet.com and www.otter.org for more information on the world's otters.

—Sarah Flaherty



WHILE THE RECOVERY of California sea otters has limped along for most of this century, until recently the Alaska otters had been rebounding beautifully. In the central Aleutian Islands, most otter populations had returned to historical levels by 1965. But now Alaska sea otters are declining at alarming rates. The population at Adak Island alone decreased by roughly a quarter each year during the 1990s.

What is causing this abrupt decline in the Alaska sea otter? Biologists have nixed a number of potential reasons. The otters aren't running out of food—sea urchins, the Alaskan otters' principal prey, have increased eight-fold at Adak Island during the otters' decline. The otters aren't reproducing poorly—just as many pups are being born and surviving now as before the decline. The otters aren't succumbing to diseases or toxins—there has been essentially no increase in carcasses found on beaches. And, they aren't leaving the central Aleutians for other parts of the region.

The surprising answer appears to be that killer whales are eating huge numbers of sea otters in Alaska, report Jim Estes of the Biological Resources Division of the U.S. Geological Survey and his colleagues in a 1998 paper in the journal *Science*.

While there is no direct proof, Estes and his colleagues base their killer whale theory on solid evidence. First, although killer whales and sea otters have both lived in the Aleutian archipelago for a long time, no one had ever seen a killer whale eat an otter until 1991. Since then, a growing number of killer whales have been seen eating otters.

Second, Estes and his colleagues compared sea otter populations in two areas of Adak Island: one with killer whales and the other without. The area with killer whales is Kulak Bay, which is open to the ocean. The area without killer whales is Clam Lagoon, which is inaccessible to whales.

The researchers found that while the sea otter population in whale-free Clam Lagoon did not change between 1993 and 1997, the population in Kulak Bay decreased by 76 percent. To make sure that the Kulak Bay otters weren't just swimming into Clam Lagoon to escape the killer whales, Estes and his colleagues tagged otters in each population. They found that the two pop-



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THE ALASKA SEA OTTER'S DISTURBING DECLINE

BY ROBIN MEADOWS

ulations hardly mixed at all and that five times as many tagged otters disappeared from Kulak Bay as from Clam Lagoon (65 percent versus 12 percent).

But is it really possible for killer whales to have eaten enough sea otters to cause the sharp decline in the Aleutian archipelago? Estes and his colleagues analyzed the otter

population living between Kiska and Seguam Islands, an area that spans about 400 miles. Before the decline, nearly 53,000 sea otters lived there. Based on a 78-percent drop over six years, the researchers estimated that about 40,000 sea otters were lost. This means that killer whales would have had to eat about 6,800 sea otters per year. Because a single killer whale can easily eat more than 1,800 otters per year, the researchers conclude that it is entirely feasible that the whales are causing the otter decline.

Why, then, would some killer whales suddenly start preying on sea otters? Estes and his colleagues blame the collapse of northwest Pacific populations of the whales' preferred prey: Steller sea lions and other pinnipeds. Pinniped numbers have been declining there since the late 1970s, and sea lions sank to their lowest levels in the Aleutians in the late 1980s, which coincides with the onset of the sea otter decline.

And why have pinnipeds been decreasing in the northwest Pacific? The numbers of fish they eat have been decreasing, partly because fisheries have been increasing their efforts in the area, say the researchers.

Here's the story in a nutshell: Fewer fish meant fewer pinnipeds, which forced hungry killer whales to start eating sea otters. And that's not all there is to the story. The effects of the fish decrease have cascaded through the ecosystem. Fewer sea otters led to more sea urchins, which led to the overgrazing of kelp forests. And, ironically, kelp forests are nurseries for baby fish, which means that the decrease in kelp forests could contribute to the decrease in fish, making this a vicious cycle.

So, if Estes and his colleagues are right, then the best way to save sea otters from killer whales is to protect fisheries in the northwest Pacific.



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carcasses found cast on beaches since 1992 shows that nearly 40 percent died of infectious diseases such as encephalitis and peritonitis. This high rate of disease could help explain why there are only about

2,000 California otters despite nearly 80 years of protection. The California population has grown only a fourth as fast as the Alaska population (about five percent versus up to 20 percent per year), even though the two populations reproduce at similar rates.

Due to the precariousness of the California sea otter, the USFWS wants to follow the Sea Otter Recovery Team's advice and let the main population expand along the southern coast. But abandoning the plan to establish new colonies

in exchange for maintaining the no-otter zone is no simple matter. The California sea otter falls under the jurisdiction of a welter of sometimes-conflicting laws, from the Endangered Species Act to the Marine Mammal Protection Act.

California sea otters even boast their very own law: Public Law 99-625, which Congress passed to authorize the USFWS to establish new colonies. This law also requires the service to maintain the no-otter zone. But there is a final twist: If the new colony at San Nicolas Island is

declared a failure, the USFWS must remove all sea otters from both the island and the no-otter zone.

Navigating through all these laws could take until spring 2001—and

that's if all goes smoothly, says the USFWS's Alcorn. Chances of that are slim. "We've heard rumbles of a lawsuit from shellfisheries," he says.

Still, the USFWS is undeterred. "Our position is that we don't want to move them because the population is in decline," says Alcorn. "There's a huge conflict between the Endangered Species Act and the Public Law—but we think the ESA trumps the Public Law." Z

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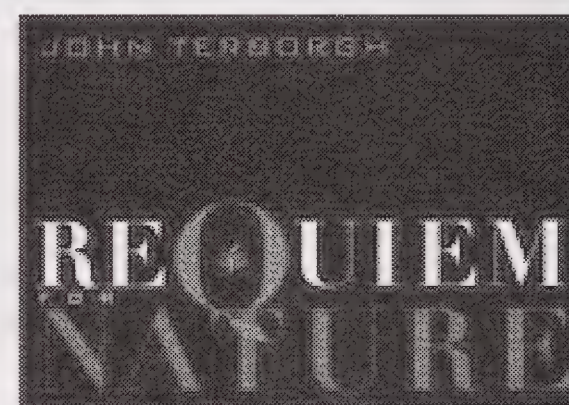
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SEA-WORTHY SEA OTTERS

The sea otter, *Enhydra lutris*, is the only exclusively marine otter species. Growing up to five and a quarter feet long and weighing up to 100 pounds, it is the heaviest and one of the biggest members of the otter family. Unlike other marine mammals, the sea otter is insulated by two layers of dense fur instead of blubber. The inner fur layer is short and fluffy, and traps air bubbles. This creates a pocket of air that keeps the otter's skin dry. The outer fur layer is made up of longer guard-hairs. This brown coat is waterproof as long as it is clean. If the outer layer gets matted and dirty, as happens in oil spills, the inner layer of fur becomes saturated and can no longer hold air bubbles, and the otter will freeze. Otters have up to one million hairs per square inch, meaning that they have more hair in one square inch than is on an entire human head (which has only about 20,000 total).

Sea otters' extremely high metabolic rate helps keep them warm, but also requires that they eat up to 30 percent of their body weight each day. This big appetite is sated by urchins, shellfish, crabs, snails, and octopi that the otters hunt in kelp beds and forage for on the ocean floor.

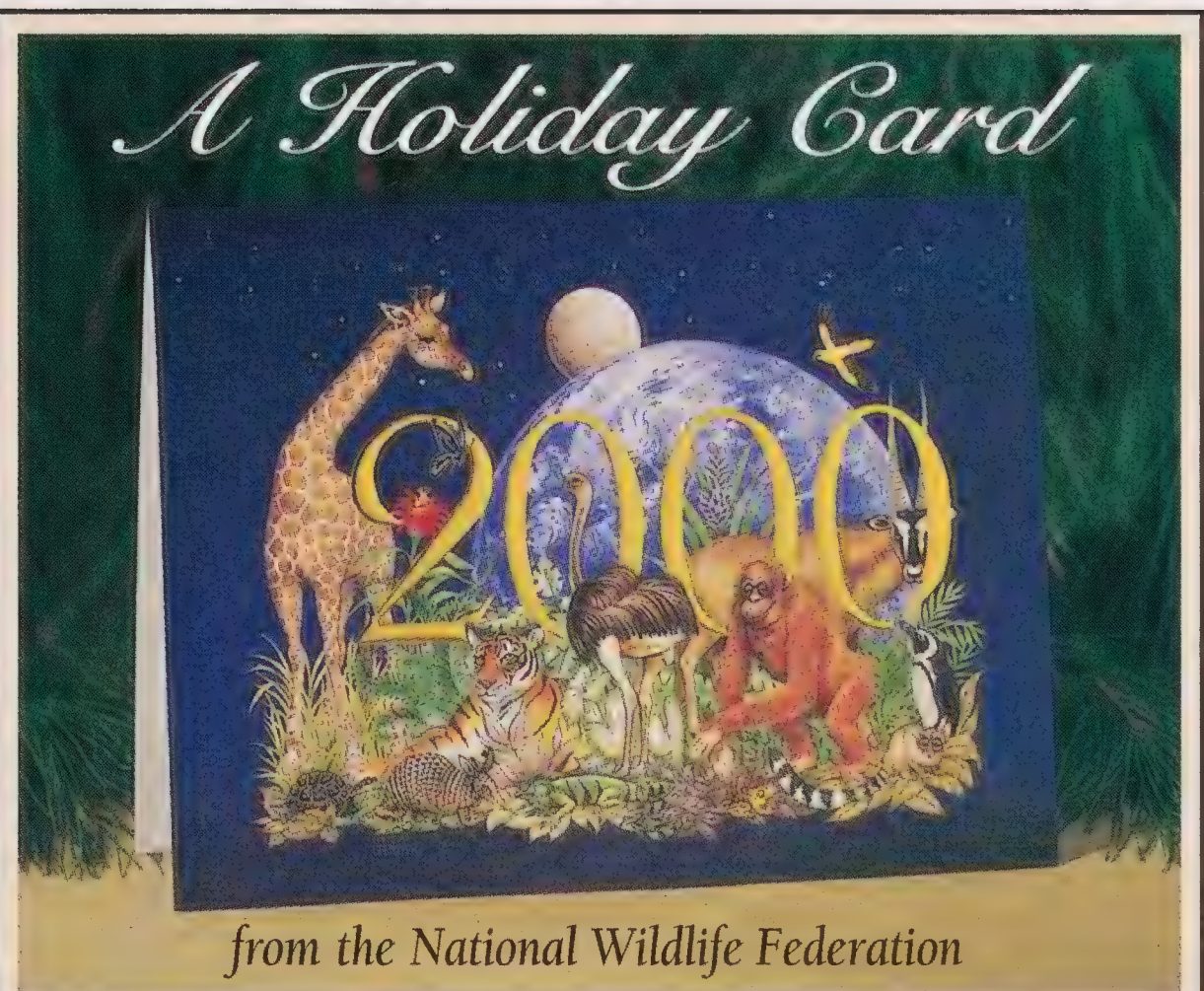
Otters usually dive for 45 to 90 seconds while hunting, but can hold their breath for up to five minutes. Their webbed hind toes propel them through the water, while they use their tails to steer. This frees their dexterous forepaws and semi-retractable claws to snatch prey, or to help pull them through the water.

One of the handful of tool-using mammals, otters use rocks to pry abalone and other shellfish off rocks. They stash their prey out of the way in pockets of skin under their forelegs (effectively their armpits) before surfacing to feast. They eat while lying on their back, using their stomach as a table—or as a counter upon which to smash open their prey with a rock.

For more information, check out the Monterey Bay Aquarium, which runs the world's only sea otter rehabilitation and breeding program, online at www.mbayaq.org/atc/atc_so.htm. Also, the Friends of the Sea Otter website, (www.seaotters.org), offers a wealth of information and photographs.

—Sarah Flaherty

AN OTTER USES ITS BELLY AS A
TABLE FOR A SEA URCHIN SNACK.



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A GREAT SPOTTED KIWI (



KIWI SAVING KIWI

BY TIM STODDARD

TUI DE ROY

(HAASTII), THE LARGEST OF THE KIWI SPECIES.



Stumbling through a dense, moonlit forest, a man blows three shrill notes on a plastic sheep-dog whistle and pauses to catch his breath. Out of the inky silence, footfalls accompanied by loud sniffing noises encircle him.

The man crouches, his heart rate skyrocketing, and gives one last blow on the whistle. Infuriated by the noise, the unseen creature charges toward him, crashing through the underbrush like a raging bull elephant. Sound like the script of a low-budget horror movie? Wait. In the next scene, a foot-tall brown bird explodes through the bushes and skids to a halt next to the man, ready to rip open his unprotected shins with razor sharp claws. But the conservation officer expertly throws a handnet over the bird and scoops up Boris, a brown kiwi acting typically territorial in his home on New Zealand's South Island. It's time for Boris' annual radio transmitter change and a quick physical examination.

Named for the sound of their raucous calls, which the sheep-dog whistle so rudely imitates, kiwis are the beloved icons and national emblem of New Zealand. These quirky birds have long graced New Zealand currency and stamps, currently appearing, for instance, on the gold \$1 coin. New Zealanders even call themselves Kiwis, a name that originated in the nation's regimental

badges and then became synonymous with New Zealand soldiers fighting abroad during the First World War. This recognition was further promoted by the logo of Kiwi Shoe Polish, which, following its creation in Australia in 1906 (by a man with a wife native to New Zealand), was marketed around the world.

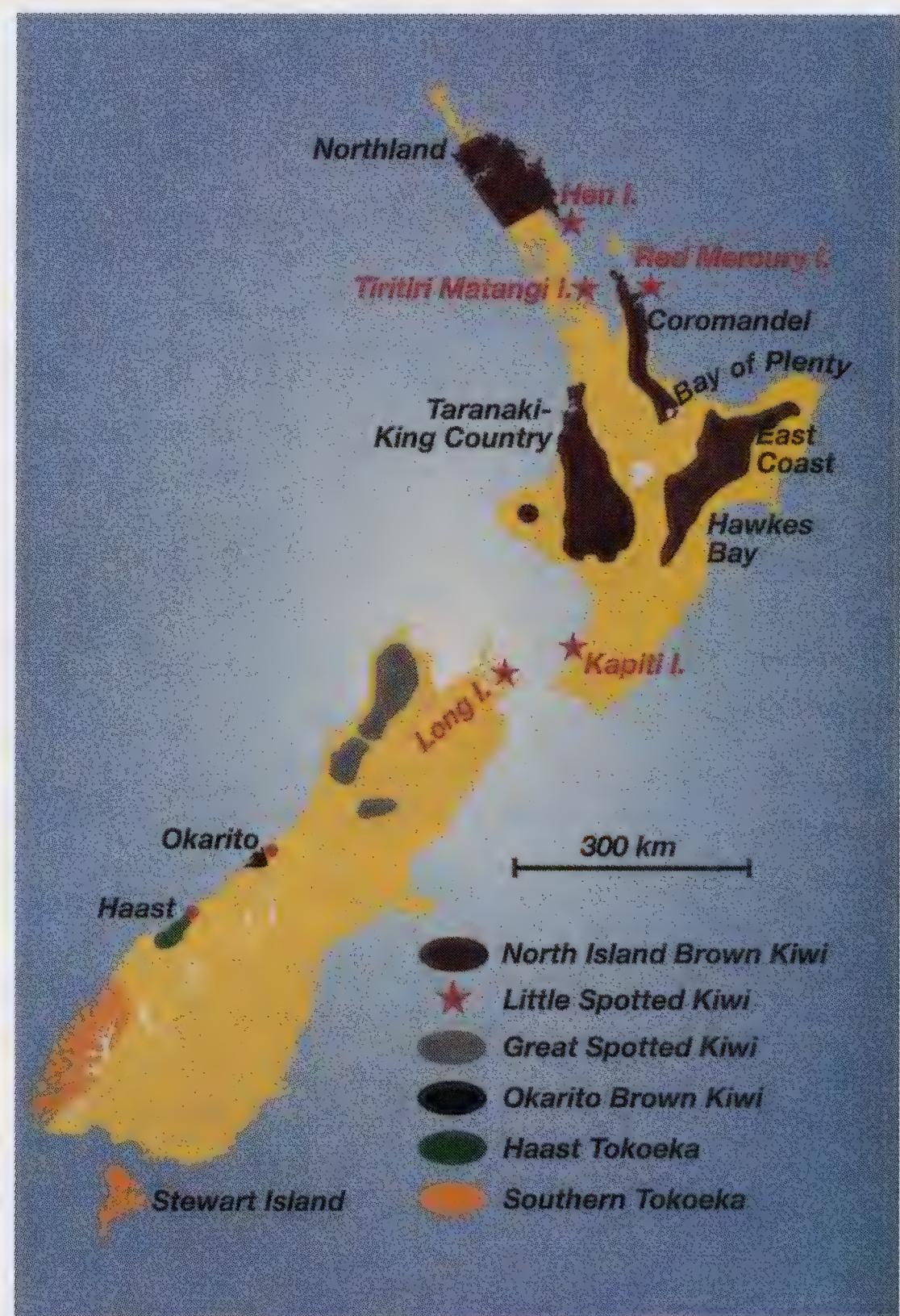
Ironically, as kiwi-adoration has grown, the population sizes of New Zealand's four kiwi species have been declining at an alarming rate, due to habitat destruction and the introduction of predatory mammals. Conservationists struggling to save these bizarre birds wonder whether future generations of "Kiwis" will know their namesakes only as images on currency and shoe-polish tins.

There are four recognized species of kiwis, with six subspecies distributed across the North and South Islands: the brown kiwi (*Apteryx mantelli*), divided into the North Island and Okarito subspecies; the great spotted kiwi (*A. haastii*); the little spotted kiwi (*A. owenii*); and the tokoeka (*A. australis*), divided into the Haast and south-

ern subspecies. (Some scientists suspect that the subspecies merit status as separate species; DNA analyses now underway should clarify this.)

All of the kiwis are pear-shaped, flightless, mostly nocturnal birds, but each species is a variation on the theme. For example, they vary in size from three to nine pounds and in height from 18 to 36 inches. Their plumage ranges from a uniform brown or gray in the brown kiwis to a spotted or barred appearance in other species. While kiwis are notorious for their bold, aggressive behavior toward anything or anyone who invades their territory, little spotted kiwis, the smallest and most endangered of the kiwi family, have a fairly mellow nature.

Kiwis possess some of the most bizarre, unbirdlike adaptations within the class Aves. Kiwis have traded keen eyesight—they are unable to see more than six feet in the dark—for acute aural and olfactory perception. Unlike those of any other bird, the kiwis' nostrils are located at the tip of their seven-inch-long flexible bills, which they use to probe through leaf litter and soil as



RANGE MAP OF NEW ZEALAND'S KIWIS.

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they sniff for earthworms, grubs, and other invertebrates that make up most of their diet. In proportion to the size of their brains, the kiwis' olfactory bulbs—the cerebral regions that coordinate the sense of smell—are the second largest recorded among birds, after petrels. In addition to these bloodhound noses, kiwis' ears are well developed. Cocking their heads toward the ground, kiwis can locate the whispering sounds of tiny arthropods deep in the humus.

Kiwi feathers lack the interlocking structures that “zip” feather barbs together in most birds, so their plumage has a spiky, fur-like appearance. (Chinese gooseberries are also called kiwi fruits for the furry texture of their skin.) At the base of their bill, long, modified feathers called rictal bristles protrude like whiskers, giving the birds a well-developed sense of touch that helps them navigate around obstacles on moonless nights. Completely tailless, with tiny stubs of vestigial wings hidden beneath their plumage (kiwis belong, appropriately, to the family Apterygidae, which literally means “wingless”), kiwis run

through the forest on muscular legs that account for over a third of their body weight. With a nocturnal lifestyle and burrowing habits to boot, some scientists jokingly refer to kiwis as honorary mammals.

Kiwi reproduction is stranger still. A female little spotted kiwi is burdened by an egg that is by far the largest relative to body size among birds, growing to 26 percent of her body weight, while the eggs of other kiwis average 15 to 20 percent of a female's weight. According to standard ratios of body mass to egg weight, kiwis, being about chicken-sized, should lay chicken-sized eggs. Instead, the bird generates a super-egg six times larger than expected, equal in size to the eggs laid by their giant relatives, the moas. Colossal, up-to-500-pound, flightless birds, moas were hunted out of existence by the Maori, the early Polynesian settlers of New Zealand.

Female kiwis lay one, two, or rarely three of these gargantuan eggs in a breeding season,





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spacing them about 33 days apart. After each egg is laid in the underground burrow or under the protective cover of a log, male kiwis have the only slightly less onerous task of incubating the egg for 70 to 85 days, nearly twice the duration of most bird species. If a subsequent egg is laid, the male incubates even longer. Along with the wandering albatross, the brown kiwi holds the record for the longest incubation period among birds.

Although it was once believed that the marathon incubation was necessary because the kiwis' eggs were too large for the birds to heat adequately, it now seems more likely that the kiwis' unusually low body temperatures of 98.6° to 101.5° F—closer to those of mammals than to the typical bird temperatures of 100.4° to 110.8° F—are responsible for the slow development.

In addition to their remarkable size, kiwi eggs have the distinction of being the most nutritious among bird ova. Whereas most precocial bird species—those in which chicks hatch downy, active, and wide-eyed—lay eggs containing



KIWIS LAY "SUPER-EGGS" WITH RICH NUTRIENTS. THEIR HATCHLINGS, LIKE THIS NORTH ISLAND BROWN KIWI (*APTERYX AUSTRALIS*), EMERGE ACTIVE AND WIDE-EYED.

35 percent yolk, kiwis manufacture energy-rich eggs containing 61 percent yolk. The proportion of yolk to the total mass of the egg is directly related to the degree of development that occurs before hatching. The payoff for all of this yolk investment is a fully feathered, mobile hatchling that requires virtually no maintenance for the first 72 to 84 hours alfresco. The baby lives off of a belly full of yolk it consumed before hatching and prepares for its first father-chaperoned foraging expedition outside of the burrow.

The obvious question, of course, is how did such a little bird evolve such an enormous egg? The traditional (and perhaps incorrect) answer is that large egg size is an advantage because well-developed chicks can fend for themselves with minimal parental care. However, it appears that the kiwi's egg did not balloon over time, but rather that the kiwi's ancestors were much larger birds, similar in size to the 500-pound moas. As the proto-kiwis evolved to their present size, their eggs did not follow suit and became increasingly disproportionate.

Among the ratites—the group of flightless ground birds that also includes African ostriches, South American rheas, and Australian/New Guinean emus and cassowaries—kiwis are the evolutionary mavericks. The common ancestor of ratites lost the ability to fly about 80 million years ago. As these land birds developed massive leg muscles, they dispersed throughout Gondwanaland, the supercontinent that broke up into the southern continents of today. The ratites gradually lost the cartilaginous keel that is prominent along the breast bones of flying birds, a feature that normally provides an anchor for one end of the powerful flight muscles.

Hatching a Plan

New Zealand's indigenous Maori revered the kiwi as the eldest child of Tane Mahuta, the god of the forest. Kiwi feathers were woven into ceremonial cloaks called kahukiwi that were draped over the shoulders to signify royalty. Maori feather hunters undoubtedly made a dent in the 12 million kiwis that inhabited New Zealand's

A "MEET-A-KIWI" DEMONSTRATION AT THE NATIONAL ZOO'S BIRD HOUSE.





GREAT SPOTTED KIWI EMERGING FROM ITS BURROW.

North and South Islands. But the kiwis' real problems didn't begin in earnest until the early 19th century, when Europeans began clearing massive tracts of forest and introducing, intentionally and accidentally, 22 species of predatory mammals where once there were none.

Adult kiwis are feisty enough to hold off most predators, but when an incubating father leaves its nest unattended to forage, domestic ferrets (*Mustela putorius furo*) and the now ubiquitous stoats (*M. erminea*)—also known as European common weasels or ermine—snatch up 50 percent of the eggs laid each year and 95 percent of the chicks that hatch. These ferocious mustelids were introduced to New Zealand in a misguided attempt to control an exploding population of

European rabbits, which were themselves introduced from exotic populations living in Australia's New South Wales in 1838.

Seemingly well-behaved domestic pets are just as dangerous to kiwis. Researchers were horrified to discover that a single dog that was somehow introduced to the Waitangi Forest killed more than 500 adult kiwi within a six-week period. The North Island common or brown kiwi is now declining at an average rate of 5.8 percent each year, which translates into a population that's halving in size every decade.

In response to these sobering statistics, the Department of Conservation (DoC), the Bank of New Zealand, and the Royal Forest and Bird Protection Society launched the Kiwi Recovery Programme (KRP) in 1991. The preliminary steps of KRP involved answering fundamental questions about the distribution of kiwi species,



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THE STOAT (*MUSTELA ERMINEA*).

their genetic variation, and the predatory behavior of stoats and other introduced mammals. The program got immediate results. During the first five years of research and management, DoC biologists were surprised to discover that two populations of birds previously described as brown kiwis (*A. mantelli*) are in fact a distinct species. These birds have been named tokoeka (*A. australis*), a Ngai Tahu word that means “weka with a walking stick.” The weka is another bird endemic to New Zealand, and the walking stick probably refers to a kiwi’s habit of methodically bobbing its beak along the ground.

In the 1960s and 1970s, some conservationists took on the heroic task of catching adult kiwis by hand and releasing them in protected forests far away from loose pets. According to Rogan Colbourne of the DoC, kiwi catching is risky business. “Kiwis are fast runners,” Colbourne explains, “particularly having the advantage at night on steep terrain and in thick undergrowth. Removing them from their burrows is an adventure in itself. The trick is dodging their striking feet.”



Not all kiwis are equally cantankerous. “The North Island brown kiwi aren’t so bad,” Colbourne confesses, “but the great spotted kiwi and South Island tokoeka can deliver nasty cuts.” One cranky bird in Fiordland repeatedly attacked Colbourne, clamping his clothing with its beak and raking its claws along his leg.

Is conserving this species worth all of the personal abuse? “No question about it,” Colbourne says. “In their own quiet way, kiwis have a lot of individual personality. And more important, New Zealand might have its share



NORTH ISLAND BROWN KIWI.

TUI DE ROY

According to standard ratios of body mass to egg weight, kiwis, being about chicken-sized, should lay chicken-sized eggs. Instead, the bird generates a super-egg six times larger than expected.

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Researchers were horrified to discover that a single dog that was somehow introduced to the Waitangi Forest killed more than 500 adult kiwi within a six-week period.

of endemic wildlife, but kiwis are our only order of birds unique to these islands. Very few countries could claim that, including the U.S.”

With the stoats destroying so many eggs and chicks, the DoC initiated Operation Nest Egg, an experiment to see if the vulnerable stages of kiwi life could be bypassed by collecting eggs from burrows, raising the chicks on predator-free islands and at the Auckland Zoo, and reintroducing them to the wild when the birds were large enough to defend themselves. To replicate the incubating conditions that male kiwis provide in the burrow, Operation Nest Egg researchers fooled some wild birds into sharing their parenting secrets. Dummy eggs with internal temperature sensors were placed under wild incubating brown kiwis. The results show that the position of the electronic eggs was rotated about 180 degrees per day. By applying these findings to eggs in incubators, the success rate for these hatchlings has steadily improved. In the last two years, the Auckland Zoo has hatched 21 out



of 24 fertile eggs from North Island brown kiwis.

Rogan Colbourne, coordinator of the Operation Nest Egg (ONE) program, reports other encouraging statistics. “Little spotted kiwis are on the increase on offshore, predator-free islands [to which they have been introduced] and the Okarito brown population has increased by about 15 percent over the last five years.

On the whole, the ONE chicks have an 85 percent chance of survival, and in October 1998, a mature ONE kiwi paired up with a wild North Island brown for the first time.”

Recognizing that stoats are public-enemy

number one for New Zealand’s birdlife, this year Conservation Minister Nick Smith

allocated new funds to accelerate DoC’s pest-management research. Colbourne admits that even though he and his staff have witnessed positive results in some areas, there’s no hope for kiwis until the stoat threat is eliminated. Researchers will be experimenting with immunocontraception, new poison baits, and various other biological controls to determine the most



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cost-effective and ecologically sound alternative. While the DoC currently uses hen eggs to lure stoats into mechanical traps, a recent study suggests that stoats are more strongly attracted to the odor of freshly killed rats, and that baiting traps with a synthetic, slow-release rat-smell may provide a more long-lasting lure.

In the end, all of these strategies will fail unless New Zealand's human Kiwis take further action to save their endangered birds. Along with

research and management, the Kiwi Recovery Programme's third avenue of action is to educate hunters, dog owners, possum trappers, and farmers about the potential threats their activities pose to the kiwi. DoC volunteers have initiated a door-knocking program in which volunteers inform residents about the plight of kiwis, sometimes surprising home owners with the news that kiwis are living virtually in their backyards.

Tui De Roy, a wildlife photographer, nature writer, and Kiwi herself, joined DoC officer Chris Rickard on his trip to refit Boris and other kiwis with new radio transmitters. She is guardedly optimistic about the fate of the kiwis. "New Zealand's DoC boasts some of the most dedicated conservationists anywhere in the world," she says. "Under public

scrutiny and skeptical politicians, they work with minimum salaries in all weathers trying to deal with a ubiquitous problem (mustelid predators). Our children's children may be lucky enough to hear kiwis calling in our future forests, but only if we give the conservationists the funding they desperately need."

De Roy learned recently that the great spotted kiwis in the mountains behind her home have gone from an estimated 15,000 to barely 11,000 individuals in the last five years. Despite her obvious fondness for kiwis, she is straightforward about the bird's prognosis. Without drastic action, New Zealand's honorary mammals may soon follow in the footsteps of their closest kin, the extinct moas. Z

A 1999 graduate of Williams College, Tim Stoddard was an intern in the FONZ Communications Office. He is now working toward a master's degree at Boston University.

A FEMALE SOUTHERN TOKOEA (A. AUSTRALIS LAWRYI) PROBES FOR ARTHROPODS IN THE ROTTING KELP OF A STEWART ISLAND BEACH.

TUI DE ROY

BOOKS. NATURALLY

***Requiem for Nature.* 1999.
John Terbourgh.
Island Press, Washington, D.C.
234 pp. Hardcover, \$29.95.**

Dictionaries define requiem as a hymn, composition, or service for the dead. So the title of this book suggests that nature is already deceased. Is this true? Does John Terbourgh, James B. Duke Professor of Environmental Science and Botany and co-director of the Center for Tropical Conservation at Duke University, and one of the world's most respected tropical biologists, believe nature is done for? Not entirely, but in his *Requiem for Nature*, Terbourgh reveals a deep pessimism about our ability to prevent the extinction of nature. He also reveals his outrage at this state of affairs.

His anger has deep roots. Growing up in northern Virginia in the boom years after World War II, he saw the forests and fields he so joyfully explored disappear before his eyes, turned into subdivisions and shopping centers. As one who truly loves wild nature and has spent half of his life living in the Peruvian tropical rainforest, he rails against his loss like a devoted spouse helplessly watching the painful death of his mate. He is vociferous in his condemnation of politicians and governments and the corporations they collude with to despoil the Earth. Not even major conservation organizations escape criticism.

Is he right? It's impossible to dismiss his concerns. Terbourgh writes, "...the greatest challenges of conservation involve nonscientific is-

ssues: overpopulation, inequities of power and wealth, exhaustion of natural resources, corruption, lawlessness, poverty, social unrest." In other words, we can save nature only if we change human nature. That's a pretty tall order, made all the more so by his belief that wild nature and the biodiversity it supports are a luxury item. Thus he dismisses any utilitarian argument for conservation. "The fundamental arguments for conservation must be spiritual and aesthetic, motivated by feelings that well up from our deepest beings. What is absolute, enduring, and irreplaceable is the primordial nourishment of our psyches afforded by a quiet walk in an ancient forest or the spectacle of a thousand snow geese against a blue sky on a crisp winter day." But hungry people are unlikely to choose nourishing their souls over nourishing their stomachs, and that is the crux of the problem: Wild nature is doomed by human nature.

In Terbourgh's view, the only way around this inevitability is through strong national or international institutions that regulate land and resource use for sustainability, and that enforce tough laws to protect parks as the last repositories of biodiversity. Doubting the ability or willingness of most nations, especially in the tropics, to do this, he favors an international

approach, such as the deployment of "nature keeping forces," akin to United Nations peacekeeping forces, to trouble spots around the world.

Many conservationists disagree, arguing that only "bottom-up" not "top-down" solutions to conservation will be effective in the long run. They seek not to send in the troops but to create volunteer "armies" of people who want to save nature because doing so improves their material as well as their spiritual well-being. The challenge is how to do this. Where this approach has been successful—in Nepal, for instance—economic benefits to local communities come largely from ecotourism, which Terbourgh notes will work only in a few places that tourists want to visit. But conservationists promoting people-friendly conservation solutions know ecotourism is not a panacea and are looking for other ways to make nature worth materially more alive than dead.

Requiem for Nature is an important book. It frames the ongoing debate in the conservation community

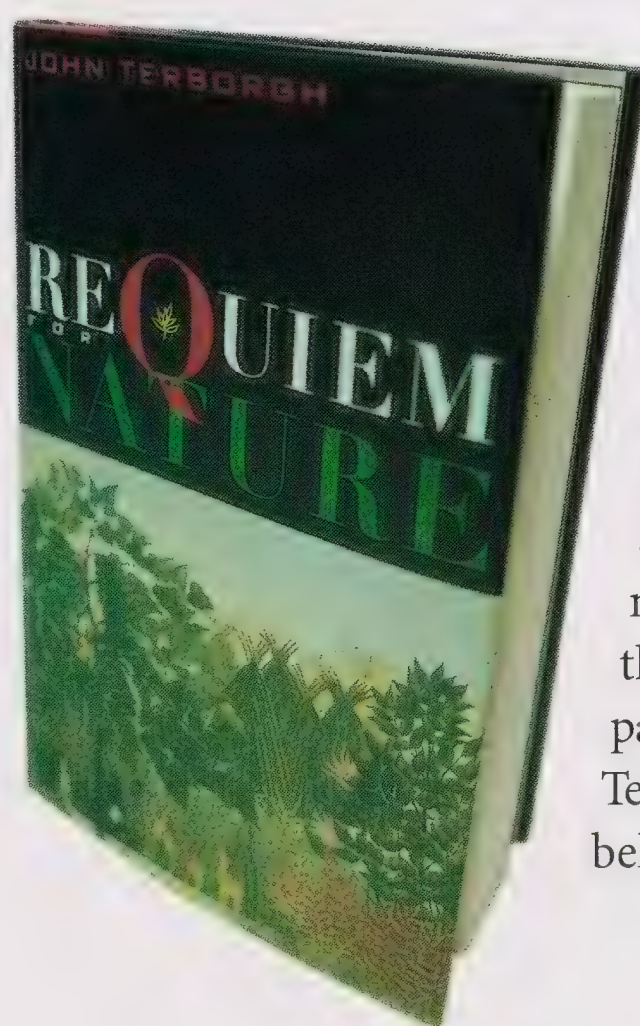
about the best way to save biodiversity, and serves notice to all of us about how difficult and desperate the situation is. But it also presents a view that may well be part of the problem, not part of the solution. Terbourgh seems to believe the only na-

ture worth saving is the nature that exists in splendid isolation from people, unless those people happen to be a chosen few—tropical biologists and the like—who use nature only to uplift their spirits and enrich their minds.

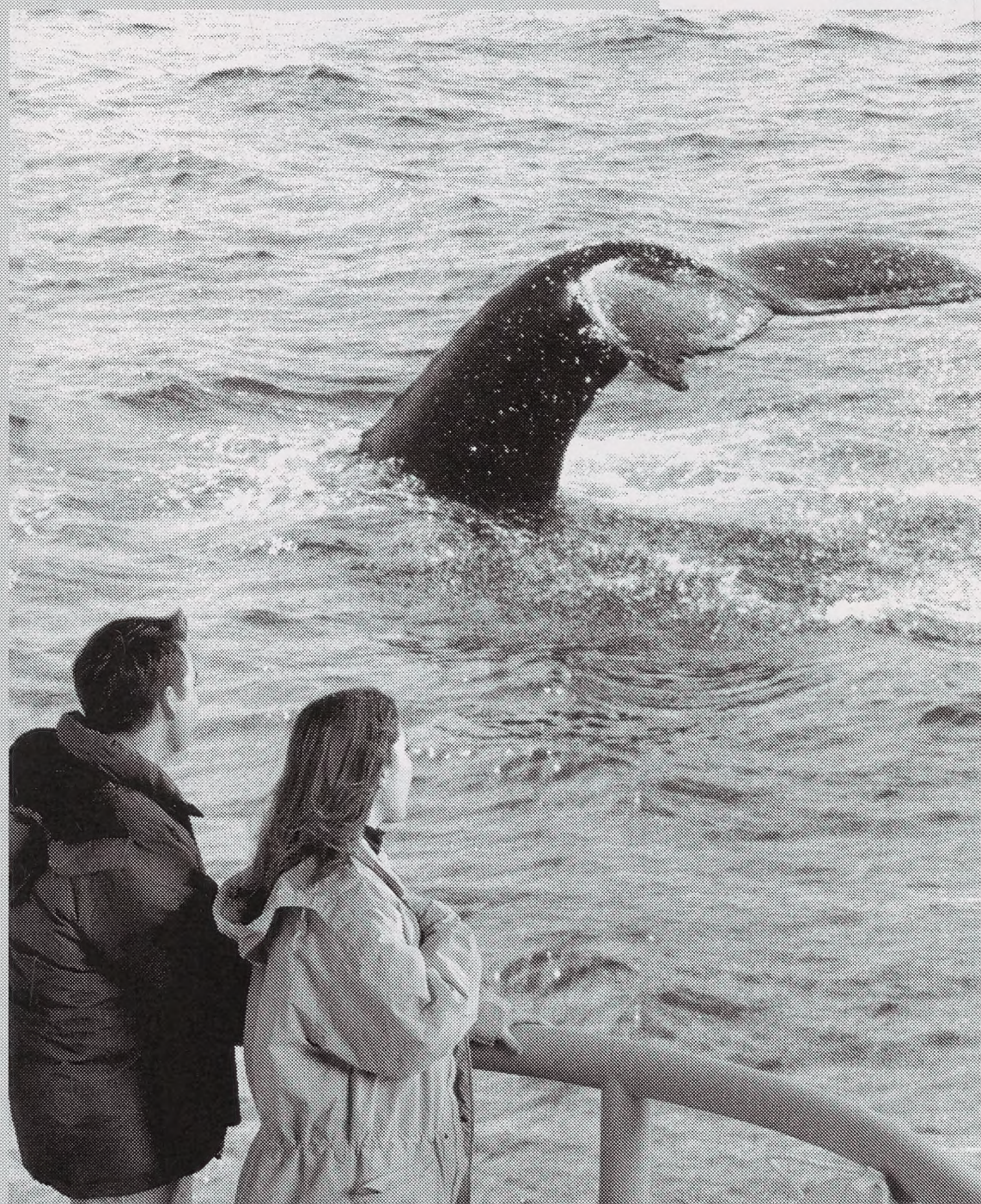
Terbourgh is expansive in his praise of the U.S. National Park Service as the stalwart protector and savior of what nature is left in our country. But parks are politically possible because huge numbers of Americans like them and use them. Put armed guards around the boundaries of our parks to keep people out and see how long that support lasts. Yet this is how Terbourgh and others suggest parks must be protected elsewhere around the world. How are people forcibly excluded from nature ever going to come to appreciate it?

In concluding *Requiem for Nature*, Terbourgh does hold out hope for the resurrection of nature. "Somehow," he writes, "we are going to have to face the fact that rational and restrained use of renewable resources offers the only route to future peace and prosperity. The person who leads the way to ending the tragedy of the commons will truly be the person who saves the world." But if Terbourgh's mournful title is not to become true, that person better turn up soon.

—Susan Lumpkin



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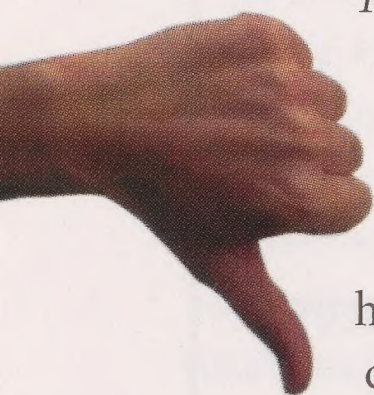


GOOD NEWS

On September 15, 1999, the Russian government halted the first-ever international commercial trade of beluga whale (*Delphinapterus leucas*) meat. Russia had planned to export over 440,000 pounds of beluga meat and blubber to Japan. The opening of international trade and the subsequent hunt of beluga whales in Russia's Sea of Okhotsk, which began around September 1, drew sharp criticism from conservation and environmental groups world-wide.

Trade was terminated after a high-level Russian cabinet meeting, held September 15, in which it was concluded that the beluga whale hunt was not sustainable and threatened the Russian Federation's commitment to environmental protection. Only a single shipment of about 28,660 pounds of beluga meat and blubber arrived on Japanese shores. The opening of the international trade in beluga meat would have set a dangerous precedent because the trade is considered a threat to the world beluga population.

—from Environmental News Network (ENN.com), September 16, 1999



BAD NEWS

Since late July 1999, at least 355 sea turtles have washed up dead or dying on the central coast of Ecuador.

Scientists have blamed the deaths on La Niña, an abnormal cooling of the eastern Pacific Ocean's surface that is currently taking place. Ocean temperatures that are

normally about 72 degrees Fahrenheit have dropped six to eight degrees, according to Franklin Ormaza, director of Ecuador's National Institute of Fisheries. Ormaza suggests that there is a direct relationship between the chilly water temperatures and the turtles' deaths. The cold water weakens the turtles' immune systems, which makes them vulnerable to viruses.

Hardest hit has been the olive ridley turtle (*Lepidochelys olivacea*), a species already listed as threatened on the U.S. Endangered Species list. Olive ridley turtles are among the smallest species of sea turtle, weighing no more than 99

pounds with olive-shaped shells 24 to 30 inches long. Scientists do not know whether the diseases carried by the turtles can be passed on to humans, so they have been urging the coastal residents not to eat the turtles. Ecuador's coast also suffered greatly last year due to El Niño, which, in contrast to La Niña, is caused by a periodic warming of the Pacific waters.

—from Associated Press, September 3, 1999; Environmental News Network (ENN.com), September 7, 1999

AREA SCENE

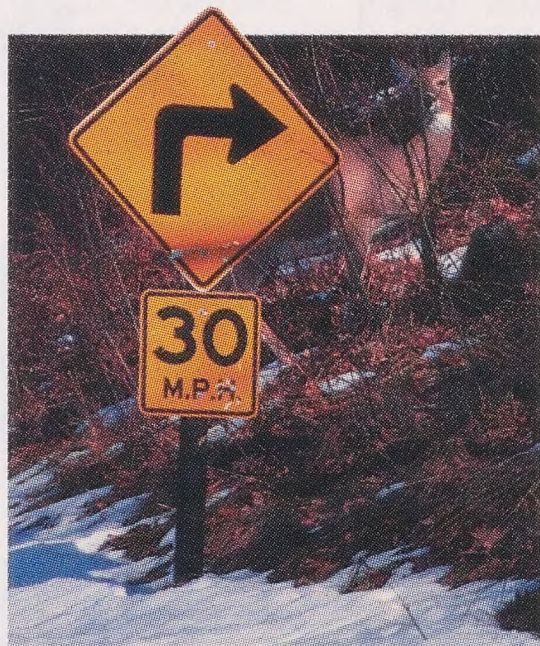
Many local animals spend November and December hunkering down for the long winter

ahead, but for white-tailed deer (*Odocoileus virginianus*) 'tis the season of love. These are the peak mating months for this abundant species, which means more deer activity—and, sadly, more dangerous deer/vehicle collisions.

According to Bob Ford, natural resource manager for Rock Creek Park, deer seeking mates venture farther than usual into the civilization of city streets. "They do some crazy things, going right out into traffic. It's a time to be extra alert," warns Ford. So the next time you wind through Rock Creek Park or along other roadways with deer postings, watch your speed, and watch out for amorous ungulates.

Americans associate late November with another creature of the eastern United States: the turkey (*Meleagris gallopavo*). Wild

turkeys have been recently spotted along the Potomac in Virginia, and in Montgomery County as close in as Bethesda, according to Jane Huff of the Audubon Naturalist Society. The birds are not yet found in Rock Creek Park, Bob Ford reports. But like the beaver and the white-tailed deer before it, the turkey is rebounding after vanishing from our region as a result of heavy hunting earlier this century. Ford hopes that wild turkeys will someday celebrate Thanksgiving by once again feasting on Rock Creek Park's bountiful acorns.



ALEX HAWES/FONZ

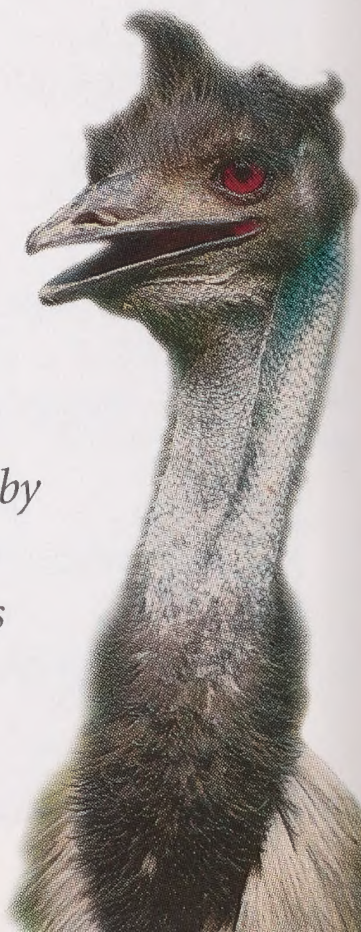
WHAT'S IN A NAME?

The ratite group includes such flightless birds as the emu, rhea, and kiwi. "Ratite" comes from the Latin word, *ratita*, a flat-bottomed boat (without a keel). Birds that fly have a large bony plate on their sternum, called a keel, to which their flight muscles attach. The flightless ratites all lack this feature, and are hence "keelless."

While for most birds flight is the primary means of quick escape, ratites run to avoid danger. The emu's scientific name, *Dromaius novaehollandiae*, takes note of this fact, as *dromaios* is Greek for "running" or "swift of foot." Meanwhile, *novaehollandiae* is the latinized form of New Holland, the name used during the 17th and 18th centuries to refer to the northeastern sections of Australia where the emu lives. The word "emu" itself is believed to have originated from one of two sources: the call of the male, which can sound like "eee—moo" or as a corrupted form of the Portuguese word for the rhea, "ema." The strong resemblance between rheas and emus may have caused some confusion between their names.

Nowadays, an "EMU" can also be an electromagnetic unit, an extravehicular mobility unit, Eastern Michigan University, or European Monetary Union.

—compiled by Sarah Flaherty and Alex Hawes



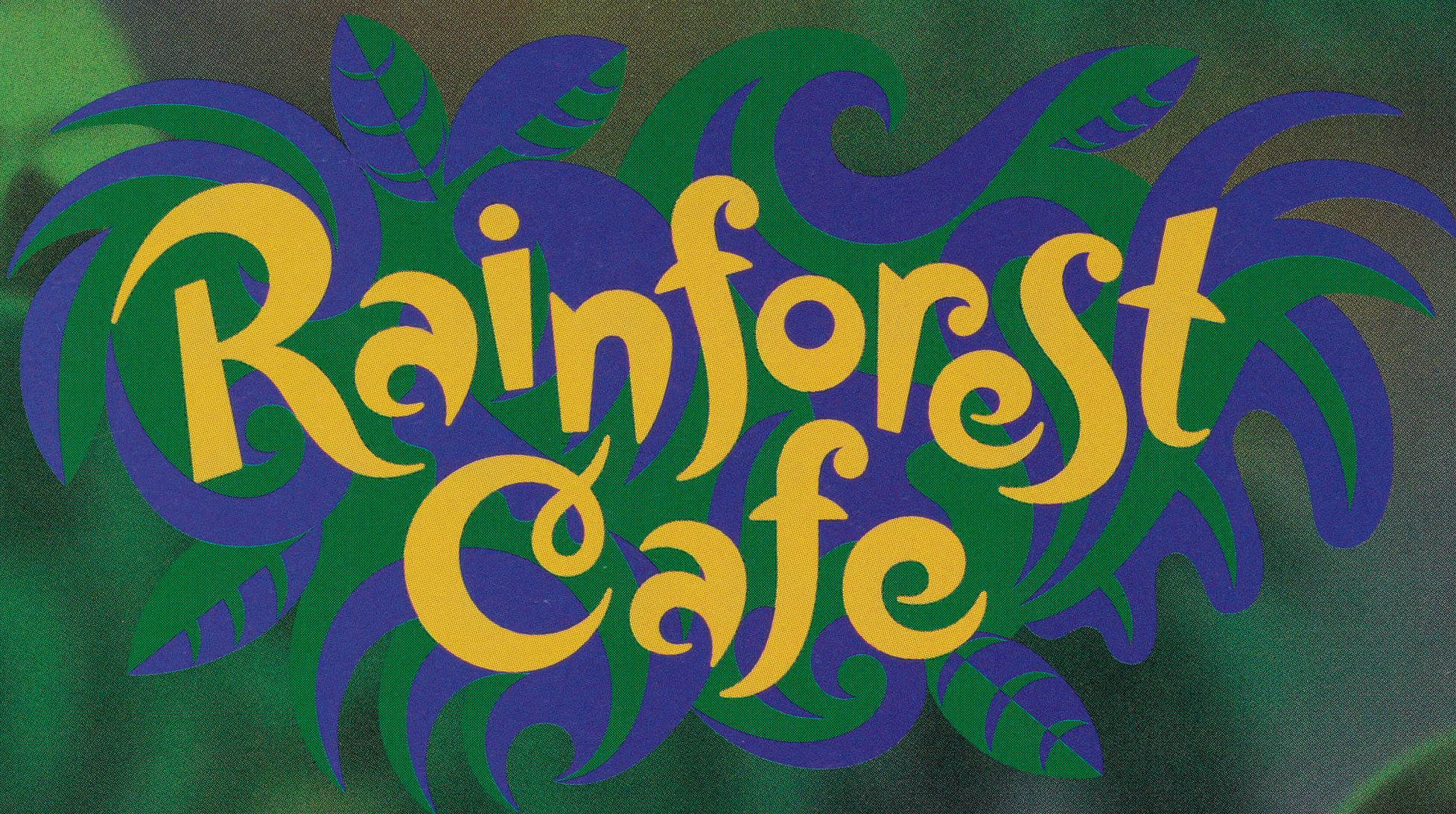


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